

## Cigarettes and Other Nicotine Products

Nicotine is one of the most heavily used addictive drugs in the United States. In 2003, 29.8 percent of the U.S. population 12 and older—70.8 million people—used tobacco at least once in the month prior to being interviewed.\* This figure includes 3.6 million young people age 12 to 17. There were no statistically significant changes in past-month rates of the different tobacco products among this age group between 2002 and 2003. However, there were significant declines in past-year and lifetime cigarette use between 2002 and 2003. In addition, the rate of past-month cigarette use decreased among 13 year-olds. Young adults aged 18 to 25 reported the highest rate of current use of any tobacco products (44.8 percent).

Cigarette smoking has been the most popular method of taking nicotine since the beginning of the 20th century. In 1989, the U.S. Surgeon General issued a report that concluded that cigarettes and other forms of tobacco, such as cigars, pipe tobacco, and chewing tobacco, are addictive and that nicotine is the drug in tobacco that causes addiction. The report also determined that smoking was

a major cause of stroke and the third leading cause of death in the United States. Statistics from the Centers for Disease Control and Prevention indicate that tobacco use remains the leading preventable cause of death in the United States, causing approximately 440,000 premature deaths each year and resulting in an annual cost of more than \$75 billion in direct medical costs. (See [www.cdc.gov/tobacco/issue.htm](http://www.cdc.gov/tobacco/issue.htm)).

### **Health Hazards** —————

Nicotine is highly addictive. Nicotine provides an almost immediate “kick” because it causes a discharge of epinephrine from the adrenal cortex. This stimulates the central nervous system and other endocrine glands, which causes a sudden release of glucose. Stimulation is then followed by depression and fatigue, leading the abuser to seek more nicotine.

Nicotine is absorbed readily from tobacco smoke in the lungs, and it does not matter whether the tobacco smoke is from cigarettes, cigars, or pipes. Nicotine also is absorbed readily when tobacco is chewed. With regular use of tobacco,

levels of nicotine accumulate in the body during the day and persist overnight. Thus, daily smokers or chewers are exposed to the effects of nicotine for 24 hours each day.

Addiction to nicotine results in withdrawal symptoms when a person tries to stop smoking. For example, a study found that when chronic smokers were deprived of cigarettes for 24 hours, they had increased anger, hostility, and aggression, and loss of social cooperation. Persons suffering from withdrawal also take longer to regain emotional equilibrium following stress. During periods of abstinence and/or craving, smokers have shown impairment across a wide range of psychomotor and cognitive functions, such as language comprehension.

Women who smoke generally have earlier menopause. If women smoke cigarettes and also take oral contraceptives, they are more prone to cardiovascular and cerebrovascular diseases than are other smokers; this is especially true for women older than 30.

Pregnant women who smoke cigarettes run an increased risk of having stillborn or premature infants or infants with low birthweight. Children of women who smoked while pregnant have an increased risk for developing conduct disorders. National studies of mothers and daughters have also found that maternal smoking during pregnancy increased

the probability that female children would smoke and would persist in smoking.

Adolescent smokeless tobacco users are more likely than nonusers to become cigarette smokers. Behavioral research is beginning to explain how social influences, such as observing adults or other peers smoking, affect whether adolescents begin to smoke cigarettes. Research has shown that teens are generally resistant to antismoking messages.

In addition to nicotine, cigarette smoke is primarily composed of a dozen gases (mainly carbon monoxide) and tar. The tar in a cigarette, which varies from about 15 mg for a regular cigarette to 7 mg in a low-tar cigarette, exposes the user to an increased risk of lung cancer, emphysema, and bronchial disorders.

The carbon monoxide in the smoke increases the chance of cardiovascular diseases. The Environmental Protection Agency has concluded that secondhand smoke causes lung cancer in adults and greatly increases the risk of respiratory illnesses in children and sudden infant death.

## **Promising Research** —————

Research has shown that nicotine, like cocaine, heroin, and marijuana, increases the level of the neurotransmitter dopamine,

which affects the brain pathways that control reward and pleasure. Scientists now have pinpointed a particular molecule [the beta 2 (b2)] subunit of the nicotine cholinergic receptor) as a critical component in nicotine addiction. Mice that lack this subunit fail to self-administer nicotine, implying that without the b2 subunit, the mice do not experience the positive reinforcing properties of nicotine. This new finding identifies a potential site for targeting the development of nicotine addiction medications.

Other new research found that individuals have greater resistance to nicotine addiction if they have a genetic variant that decreases the function of the enzyme CYP2A6. The decrease in CYP2A6 slows the breakdown of nicotine and protects individuals against nicotine addiction. Understanding the role of this enzyme in nicotine addiction gives a new target for developing more effective medications to help people stop smoking. Medications might be developed that can inhibit the function of CYP2A6, thus providing a new approach to preventing and treating nicotine addiction.

Another study found dramatic changes in the brain's pleasure circuits during withdrawal from chronic nicotine use. These changes are comparable in magnitude and duration to similar changes observed during withdrawal from other abused drugs such as cocaine, opiates, amphetamines, and alcohol. Scientists found

significant decreases in the sensitivity of the brains of laboratory rats to pleasurable stimulation after nicotine administration was abruptly stopped. These changes lasted several days and may correspond to the anxiety and depression experienced by humans for several days after quitting smoking "cold turkey." The results of this research may help in the development of better treatments for the withdrawal symptoms that may interfere with individuals' attempts to quit smoking.

## **Treatment** —————

Studies have shown that pharmacological treatment combined with behavioral treatment, including psychological support and skills training to overcome high-risk situations, results in some of the highest long-term abstinence rates. Generally, rates of relapse for smoking cessation are highest in the first few weeks and months and diminish considerably after about 3 months.

Behavioral economic studies find that alternative rewards and reinforcers can reduce cigarette use. One study found that the greatest reductions in cigarette use were achieved when smoking cost was increased in combination with the presence of alternative recreational activities.

Nicotine chewing gum is one medication approved by the Food and Drug Administration (FDA) for the treatment of nicotine

dependence. Nicotine in this form acts as a nicotine replacement to help smokers quit smoking.

The success rates for smoking cessation treatment with nicotine chewing gum vary considerably across studies, but evidence suggests that it is a safe means of facilitating smoking cessation if chewed according to instructions and restricted to patients who are under medical supervision.

Another approach to smoking cessation is the nicotine transdermal patch, a skin patch that delivers a relatively constant amount of nicotine to the person wearing it. A research team at NIDA's Intramural Research Program studied the safety, mechanism of action, and abuse liability of the patch that was consequently approved by FDA. Both nicotine gum and the nicotine patch, as well as other nicotine replacements such as sprays and inhalers, are used to help people fully quit smoking by reducing withdrawal symptoms and preventing relapse while undergoing behavioral treatment.

Another tool in treating nicotine addiction is a medication that goes by the trade name Zyban. This is not a nicotine replacement, as are the gum and patch. Rather, this works on other areas of the brain, and its effectiveness is in helping to make nicotine craving, or thoughts about cigarette use, more controllable in people who are trying to quit.

## **Extent of Use** —————

### **2004 Monitoring the Future (MTF) Survey\*\***

Despite the demonstrated health risk associated with cigarette smoking, young Americans continue to smoke. However, 30-day smoking rates among high school students are declining from peaks reached in 1996 for 8th-graders (21.0 percent) and 10th-graders (30.4 percent) and in 1997 for seniors (36.5 percent). In 2004, 30-day\*\*\* rates reached the lowest levels ever reported by MTF for 8th-graders (9.2 percent) and 10th-graders (16.0 percent). Twenty-five percent of high school seniors reported smoking during the month preceding their responses to the survey.

Lifetime cigarette use among 10th-graders decreased significantly, from 43.0 percent in 2003 to 40.7 percent in 2004. Among 10th-graders, there was a significant decrease in the number of students reporting that they smoke one-half pack or more cigarettes per day.

The decrease in smoking rates among young Americans corresponds to several years in which increased proportions of teens said they believe there is a "great" health risk associated with cigarette smoking and expressed disapproval of smoking one or more packs of cigarettes a day. Students' personal disapproval of smoking had risen for some years, but showed no further increase in 2004.

In 2004, 85.7 percent of 8th-graders, 82.7 percent of 10th-graders, and 76.2 percent of 12th-graders stated that they “disapprove” or “strongly disapprove” of people smoking one or more packs of cigarettes per day. In addition, 8th- and 10th-graders reported significant increases in the perceived harmfulness of smoking one or more packs of cigarettes per day.

## **Other Information Sources** —————

For additional information on nicotine abuse and addiction, please visit [www.smoking.drugabuse.gov](http://www.smoking.drugabuse.gov).

For more information on how to quit smoking, please visit [www.cdc.gov/tobacco](http://www.cdc.gov/tobacco).

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\* NSDUH (formerly known as the National Household Survey on Drug Abuse) is an annual survey of Americans age 12 and older conducted by the Substance Abuse and Mental Health Services Administration. Copies of the latest survey are available at [www.samhsa.gov](http://www.samhsa.gov) and from the National Clearinghouse for Alcohol and Drug Information at 1-800-729-6686.

\*\* These data are from the 2004 Monitoring the Future Survey, funded by the National Institute on Drug Abuse, National Institutes of Health, DHHS, and conducted by the University of Michigan’s Institute for Social Research. The survey has tracked 12th-graders’ illicit drug use and related attitudes since 1975; in 1991, 8th- and 10th-graders were added to the study. The latest data are online at [www.drugabuse.gov](http://www.drugabuse.gov).

\*\*\* “Lifetime” refers to use at least once during a respondent’s lifetime. “Annual” refers to an individual’s drug use at least once during the year preceding their response to the survey. “30-day” refers to an individual’s drug use at least once during the month preceding their response to the survey.

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